**Journal of World Englishes and Educational Practices**
ISSN: 2707-7586
DOI: 10.32996/jweep
Journal Homepage: www.al-kindipublisher.com/index.php/jweep

JWEEP
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

**| RESEARCH ARTICLE**

# Innovating Education: Strengthening Teacher Competence Through Technology-Enhanced Instruction

**ZHANG YANDE**
*Master of Arts in Education Major in Educational Management, University of Perpetual Help System Laguna*
**Corresponding Author:** ZHANG YANDE, **E-mail**: 104047076@qq.com

**| ABSTRACT**
The research focused on the utilization of educational technology in teaching and its impact on teachers' instructional competence and effectiveness. It emphasized the significance of integrating technology in the 21st-century educational landscape to enhance learning outcomes. The study, conducted with 341 teachers in a district in China, revealed that effective technology integration enriches teaching practices, fosters student engagement, and improves academic growth, particularly highlighted during the pandemic. Findings showed a positive correlation between technology use and teachers' instructional effectiveness. The study advocates for continuous professional development to enhance teachers' technological skills, asserting that educational technology is a transformative force in modern education, enriching the learning experience and improving accessibility.

**| KEYWORDS**
Educational technology, display instructional competence, and achieve teaching effectiveness

**| ARTICLE INFORMATION**
**ACCEPTED:** 01 November 2025 **PUBLISHED:** 15 November 2025 **DOI:** 10.32996/jweep.2025.7.4.2

## Introduction

The integration of technological tools is significantly transforming education, expanding learning beyond traditional classrooms through mobile devices and online platforms. This shift, supported by research indicating a global movement toward technology in education, highlights the necessity for supportive institutional frameworks. Effective technology integration requires reimagining instructional methods to prioritize student learning outcomes and fostering holistic development. However, challenges remain, particularly regarding teachers' readiness and skills in using ICT effectively. Teachers are pivotal in aligning technology with pedagogical practices, as their competence impacts the success of educational reforms. The study aims to investigate how teachers in a district in China engage with educational technology and its relationship to their instructional effectiveness, contributing to discussions on enhancing teaching and learning outcomes through innovation.

Educational technology is the strategic integration of scientific and technological insights into teaching and learning, designed to improve educational effectiveness. Traditional lecture-based methods may disengage students, while technology enables interactive, dynamic learning experiences. This discipline merges learning sciences with pedagogy, focusing on developing, implementing, and assessing tools and methodologies that support educational goals. Key principles include utilizing technology to shape behavior, acknowledging learning as a process, and promoting experiential learning.

Moreover, the design of engaging learning environments, methods that foster critical thinking, and recognition of student diversity are essential elements. The integration of technology not only enhances learning for diverse age groups but also addresses historical adoption challenges in education.

Educational technology encompasses various tools, including mobile devices and e-learning platforms, facilitating personalized, accessible learning experiences. Teachers' continuous professional development and positive attitudes toward technology are integral for effective implementation, as is recognizing the multifaceted nature of instruction.

Emerging practices like gamification leverage game mechanics to foster engagement and enhance learning outcomes, and both synchronous and asynchronous online learning modalities play a significant role in modern education.

Research highlights the positive impact of educational technology on student performance, particularly when combined with effective pedagogy. Effective online teaching practices focus on structured instruction and fostering social presence, ensuring that technology integration enriches learning experiences. Challenges such as resource availability and teacher preparedness in ICT further underline the necessity for comprehensive support and development in educational technology utilization.

**Research Objectives**

The central purpose of this study was to examine how teachers in the District utilize educational technology, display instructional competence, and achieve teaching effectiveness.

The specific objectives of the study were:

1. To describe the extent of teachers' utilization of educational technology.
2. To describe the degree do teachers demonstrate instructional competence.
3. To describe the level of teaching effectiveness among teachers
4. To determine the significant correlation between teachers' utilization of educational technology and their instructional competence.
5. To determine the significant relationship between teachers' utilization of educational technology and their teaching effectiveness.
6. To discover if there is a substantial association between teachers' instructional competence and their teaching effectiveness.
7. To propose strategies to strengthen teachers' use of educational technology, enhance instructional competence, and improve overall teaching effectiveness.

**Methodology**

***Research Design***

The study aimed to investigate the use of educational technology, assess instructional competence, and evaluate effectiveness among teachers in a District. A descriptive-correlational research design was utilized, enabling the exploration of relationships among variables without manipulation. A survey method gathered primary data directly from elementary school teachers in China for the 2020-2021 academic year, capturing their experiences with technology and instructional practices. Secondary data from scholarly literature supported the study's framework, helping to contextualize the findings.

**Respondents of the Study**

The study focused on a specific population of elementary school teachers within the District. From this population, a total of 341 teachers were selected as participants for the 2020-2021 academic year. The sample size was determined using Slovin's formula, considering a 5% margin of error, ensuring that the sample was representative of the overall teacher population. This approach provided sufficient statistical power to analyze correlations between variables and draw meaningful conclusions.

**Instrument of the Study**

A researcher-developed questionnaire was the main data collection tool, consisting of three parts: measuring educational technology utilization, assessing teachers' instructional competence, and evaluating perceived effectiveness. The instrument was validated through expert evaluations and modified for clarity and relevance, receiving final approval from the research advisor. Its reliability was confirmed via Cronbach's Alpha. The study aimed to explore the relationships between educational technology utilization, instructional competence, and teacher effectiveness, providing descriptive and analytical insights.

***Data Gathering Procedure***

The survey questionnaire was utilized as the primary data collection tool in this descriptive study, selected for its effectiveness in reaching a large number of respondents. A draft was prepared and reviewed for clarity and quality before securing permission from schools for distribution. The questionnaire was administered electronically via Google Forms, ensuring confidentiality and voluntary participation. Completed questionnaires were emailed to the researcher, and the collected data were organized and analyzed to extract insights related to the research objectives.

**Treatment and Analysis of Data**

Weighted Mean was employed to assess the levels of Utilization of Educational Technology, Teacher's Instructional Competence, and Effectiveness among the respondents.

Pearson correlation coefficient (r) was utilized to establish the relationships between the levels of Utilization of Educational Technology, Teacher's Instructional Competence, and Effectiveness among the respondents.

**Results and Discussion*s***

***Table 1. The Teachers' Level of Utilization of Educational Technology***

| **Indicators** | **Weighted Mean** | **Verbal Interpretation** | **Rank** |
|---|---|---|---|
| 1. Explore educational websites like LRMDS, and others for curriculum-relevant contents to inform the lesson. | 3.49 | High | 6.5 |
| 2. Explore educational websites like, LRMDS and others for adaptable educational resources like songs, videos, etc. to enrich the lesson. | 3.49 | High | 6.5 |
| 3. Use computer applications such as MS Word, Excel, PowerPoint and others in planning, i.e. lesson plans, exemplars or weekly home learning plans. | 3.72 | Very High | 1 |
| 4. Use computer applications such as MS Word, Excel, PowerPoint and others in assessing/evaluating learning i. e. activity sheets, written work or performance tasks. | 3.66 | Very High | 3 |
| 5. Use computer applications such MS Word, Excel PowerPoint, and others in reporting i.e. record keeping, learners' profiles or learners' self-monitoring tools. | 3.68 | Very High | 2 |
| 6. Use online software or apps like facebook, gmeet or zoom, and others to provide parents/guardians feedback on learners' progress. | 3.64 | Very High | 4 |
| 7. Use online software or apps like facebook, gmeet or zoom and others to encourage and recognize parents/guardians contributions to learners' progress. | 3.60 | Very High | 5 |
| 8. Use digital contents from LRMDS and others for required activities. | 3.45 | High | 9.5 |
| 9. Use digital contents from LRMDS and others for activities. | 3.45 | High | 9.5 |
| 10. Use basic creation, storage, and retrieval of teaching learning resources. | 3.48 | High | 8 |
| **Average** | **3.56** | **Very High** | |

Table 1 showed that educators in the District demonstrate a high engagement with educational technology, as shown in the analysis. The highest utilization is reflected in Indicator 3 (use of MS Word, Excel, PowerPoint for lesson planning) with a weighted mean of 3.72. Indicator 5 (computer applications for reporting) follows closely with 3.68, and Indicator 4 (assessing learning via computer applications) scores 3.66. Other noteworthy indicators include the use of online platforms for parent feedback (4th, 3.64) and acknowledging parental contributions (5th, 3.60). The overall average weighted mean of 3.56 signifies a very high level of utilization. The findings highlight the importance of technology integration by teachers, facilitating enhanced

instructional efficiency and promoting individualized learning, supported by research emphasizing the need for educators to align technology with curricular goals and support lifelong learning practices.

***Table 2. The Teachers' Level of Instructional Competence***

| **Indicators** | **Weighted Mean** | **Verbal Interpretation** | **Rank** |
|---|---|---|---|
| 1. Decide which educational websites like LRMDS, and others to use for curriculum-relevant contents to inform the lesson. | 3.43 | High | 8 |
| 2. Evaluate which educational websites like LRMDS and others for adaptable educational resources like songs, videos, etc. to enrich the lesson. | 3.40 | High | 10 |
| 3. Exhibit various skills in the use of computer applications such MS Word, Excel, PowerPoint, and others in planning i.e. lesson plans, exemplars or weekly home learning plans. | 3.54 | Very High | 1 |
| 4. Exhibit various skills in the use of computer applications such MS Word, Excel, PowerPoint and others in assessing/evaluating learning i.e. activity sheets, written works, or performance tasks. | 3.51 | Very High | 3 |
| 5. Exhibit various skills in the use of computer applications such MS Word, Excel, PowerPoint and others in reporting, i.e. record-keeping, management of ECD results, learners' profiles or learners'self-monitoring tools. | 3.52 | Very High | 2 |
| 6. Maximize the use of online softwares or apps like facebook, gmeet, or zoom and others to provide parents/guardians feedback on learners' progress, or problem-solve when technical difficulties arise. | 3.49 | High | 4 |
| 7. Maximize the use of online softwares or apps like facebook, gmeet, or zoom and others to encourage and recognize parents/guardians contributions to learners' progress. | 3.48 | High | 5.5 |
| 8. Provide extended support for parents and learners in the integration of digital contents from LRMDS and others for independent practice. | 3.45 | High | 7 |
| 9. Evaluate content and adaptability of digital contents from the LRMDS | 3.41 | High | 9 |
| 10. Manage your own digital teaching-learning resources by creating, storing, and retrieving them with ease. | 3.48 | High | 5.5 |
| **Average** | **3.47** | **High** | |

Table 2 showed the analysis of teachers' instructional competence indicated varied outcomes, showcasing both strengths and areas for growth. The highest-ranking indicator was the ability to utilize computer applications for planning instructional activities, achieving a weighted mean of 3.54. This highlights teachers' proficiency in integrating digital tools in instruction. Other strong indicators included the effective management of student data (3.52) and assessment techniques (3.51). While teachers showed high competence in leveraging technology, areas such as utilizing online platforms for parent engagement and adapting digital content received lower ratings, indicating potential for further improvement. The overall average weighted mean of 3.47 suggests a high instructional competence, aligning with research emphasizing the need for teacher preparation in integrating ICT into teaching. This integration fosters student engagement and enhances learning experiences.

| **Indicators** | **Weighted Mean** | **Verbal Interpretation** | **Rank** |
|---|---|---|---|
| 1. The integration of dependable information from exploring educational websites like LRMDS, and others for curriculum-relevant contents informs the lesson and improve teacher awareness on diverse learner needs. | 3.45 | High | 10 |
| 2. The use of educational songs, videos, etc. helps improve the learner's motivation, and potentials in reading and writing | 3.60 | Very High | 2.5 |
| 3. The use of computer applications such as MS Word, Excel, PowerPoint, and others in planning, i.e. lesson plans,exemplars, or weekly home learning plans enhances the teacher's editing, self-checking and analytical functions with contents and formats. | 3.62 | Very High | 1 |
| 4. The use of computer applications such as MS Word, Excel, PowerPoint, and other enhances the effectiveness of assessing/evaluating learning i.e. activity sheets or worksheets,written works or performance tasks. | 3.60 | Very High | 2.5 |
| 5. The use of computer applications such as MS Word, Excel, PowerPoint, and others facilitates the reporting i.e. record- keeping, management of ECD results, learners' profiles, self-monitoring tools. | 3.57 | Very High | 4.5 |
| 6. The sustained use of online softwares or apps like facebook, gmeet, or zoom and others to provide parents/guardians' feedback on learners' progress enhaces teacher's collaboration skills or linkages with community. | 3.57 | Very High | 4.5 |
| 7. The sustained use of online softwares or apps like facebook, gmeet, or zoom and others to encourage and recognize parents/guardians' contributions to learners' progress fosters meaningful communications with parents/guardians and with the learners alike. | 3.53 | Very High | 7 |
| 8. The use resources from LRMDS, and others for required activities helps the learners express their thoughts better. | 3.51 | Very High | 8 |
| 9. The use of digital contents from the LRMDS and others for independent practice provides for meaning full contents that help the learners improve their communication skills. | 3.49 | High | 9 |
| 10. The digital contents and files managed by the teacher show evidence of learners' active engagement with the lessons and the learners' improved experiences. | 3.54 | Very High | 6 |
| **Average** | **3.55** | **Very High** | |

Table 3 showed the analysis of Teachers' Level of Effectiveness indicates a very high level of effectiveness in their application of digital tools across multiple indicators. Indicator 3, concerning the use of applications like MS Word and Excel for planning, ranked first with a weighted mean of 3.62. Indicators focusing on educational multimedia and assessment practices both received a mean of 3.60, showcasing their ability to enhance student engagement. Additional indicators on reporting and online feedback achieved a mean of 3.57. The analysis highlights effective communication with parents and resource utilization to support independent learning. The overall average weighted mean of 3.55 signifies a strong pedagogical rationale supporting effective teaching practices, aligning with the notion that modern technologies enhance educational access and collaboration, making learning more adaptable and inclusive for 21st-century classrooms.

**Table 4. Relationship between the Teachers' Level of Utilization of Educational Technology and their Level of Instructional Competence**

| Indicators | Pearson r value | p-value | Interpretation |
|---|---|---|---|
| Teachers' Level of Utilization of Educational Technology and their Level of Instructional Competence | 0.746 Moderate correlation | 0.000 | Significant |
| **Significance Level @ 0.01** | | | |

Table 4 showed thate there is a significant correlation between teachers' usage of educational technology and their instructional competence, with a probability value of 0.000 indicating a strong positive relationship. As teachers use technology more, their competence improves. This supports Roslan's (2016) findings that proficient computer users view information systems as beneficial and are more confident in utilizing digital tools. Therefore, improving teacher acceptance and use of educational technology necessitates fostering positive attitudes and enhancing ICT competency, allowing for better instructional delivery and integration of digital tools in education.

**Table 5. Relationship between the Teachers' Level of Utilization of Educational Technology and their Level of Effectiveness**

| Indicators | Pearson r value | p-value | Interpretation |
|---|---|---|---|
| Teachers' Level of Utilization of Educational Technology and their Level of Effectiveness | 0.737 Moderate correlation | 0.000 | Significant |
| **Significance Level @ 0.01** | | | |

Table 5 showed that there is significant correlation was found between teachers' use of educational technology and their effectiveness, with a probability value of 0.000 indicating that higher technology utilization boosts teacher effectiveness. This aligns with Warwick (2018), emphasizing the importance of ICT awareness among educators for engaging lessons. The study advocates for training programs to enhance teachers' ICT integration skills, which improves instructional delivery, fosters creativity, and strengthens critical thinking. Integrating ICT positions teachers as key facilitators in modern pedagogy, enhancing learning outcomes and promoting innovative approaches for 21st-century education.

**Table 6. Relationship between the Teachers' Level of Instructional Competence and their Level of Effectiveness**

| Indicators | Pearson r value | p-value | Interpretation |
|---|---|---|---|
| Teachers' Level of Instructional Competence and their Level of Effectiveness | 0.777 Moderate correlation | 0.000 | Significant |
| **Significance Level @ 0.01** | | | |

Table 6 showed the analysis reveals a significant positive relationship (p-value 0.000) between teachers' instructional competence and effectiveness. Consistent with Jackson (2018), the study underscores the necessity for teachers to possess diverse competencies to enhance student learning outcomes. Effective instructional strategies and active teaching methods lead to improved student mastery, emphasizing the critical impact of teacher competence on educational success.

**Conclusions**

Based on the study's findings, the following conclusions were drawn:

1. Teachers demonstrated a very high level of educational technology utilization.

2. Instructional competence among teachers was found to be at a high level.
3. Teachers' overall effectiveness was assessed as very high.

4. A significant positive correlation was found between teachers' use of educational technology and their instructional competence.

5. A positive relationship was established between teachers' utilization of educational technology and their teaching effectiveness.

6. A positive correlation was also observed between teachers' instructional competence and their overall effectiveness.

7. The comprehensive implementation of the proposed action plan is essential to further enhance the utilization of educational technology, strengthen instructional competence, and improve the teaching effectiveness of public school teachers in the selected District in China.

**Recommendations**

The following recommendations are formulated based on the findings and conclusions of this study:

1. Teachers should continuously strengthen their use of educational technology by exploring online resources such as LRMDS for curriculum-based content, applying computer applications like MS Word, Excel, and PowerPoint in lesson planning, assessment, and reporting, and integrating diverse digital materials into classroom activities.

2. Teachers must sustain a high level of instructional competence by showcasing proficiency in computer applications for planning, maximizing online tools for feedback, and developing the ability to troubleshoot technical challenges.

3. Strengthening the link between technology utilization and instructional competence is crucial. Teachers are encouraged to use technology with confidence, adopt learner-centered approaches, and design engaging and interactive learning environments.

4. The relationship between educational technology use and teaching effectiveness should also be emphasized. Teachers need to choose appropriate software, evaluate its relevance and impact, and master its application in various instructional contexts.

5. Recognizing the influence of instructional competence on effectiveness is essential. Teachers should ensure that technology integration, instructional materials, and assessment practices contribute meaningfully to effective teaching. Online tools further extend learning opportunities beyond time and place, while promoting interaction and collaboration among students and teachers.

6. The proposed action plan should be formally presented to school administrators for adoption and implementation.

7. Future research should be conducted to evaluate the impact of the action plan on improving teachers' use of educational technology, instructional competence, and teaching effectiveness.

8. Subsequent studies may expand the scope to include additional factors influencing the utilization of educational technology, instructional competence, and teaching effectiveness among teachers.

**References**

[1] Abdullah S. et.al (2016) "Survey Toward a Smart Campus Using the Internet of Things," 2016 IEEE 4th International Conference on Future Internet of Things and Cloud (FiCloud), Vienna, 2016, pp. 235-239, doi: 10.1109/FiCloud.2016.41.

[2] Abdul Aziz, N. (2020). Educational game for learning skills in creative and logic development on children aged three years. *International Journal of advanced research in technology and innovation, 1*(3), 12-20

[3] Al-dalahmeh, M.A. (2017), "Intellectual capital, knowledge management and social capital within the ICT sector in Jordan", *Journal of Intellectual Capital*, Vol. 18 No. 2, pp. 437-462. https://doi.org/10.1108/JIC-

[4] Bajovic (2018) Playing and learning across the concrete and digital realms: a new context for the new learners, *International Journal of Play*, 7:2, 199- 209, DOI: 10.1080/21594937.2018.1496002

[5] Berry S. (2017) Gap Analysis of the Service Quality of a University ICT Centrein Nigeria O.V. Mejabi, Ph.DDepartment of Information and Communication Science, University of Ilorin, Nigeria E-mail: ovmejabi@unilorin.edu.ng

[6] Blackwell (2019) Predicting Finnish subject-teachers' ICT use in Home Economics based on teacher- and school-level factors, Education Inquiry, DOI: 10.1080/20004508.2020.1778609

[7] Blair, Robert David (2018) Exploring barriers to us of social media in support of non- formal learning by pupils attending secondary education in the UK: a mixed method approach. *University of Southampton, Doctoral Thesis*, 266pp.

[8] Brush, et.al (2017) Supporting Change in Teacher Practice: Examining Shifts of Teachers' Professional Development Preferences and Needs for Technology Integration. *Contemporary Issues in Technology and Teacher Education, 17*(4), 522-548 from https://www.learntechlib.org/primary/p/178710/.

[9] Cagiltay K. et al. (2017) In-service Preschool Teachers' Thoughts about Technology and Technology Use in Early Educational Settings. *Contemporary Educational Technology, 8*(2), 119-141. https://doi.org/10.30935/cedtech/6191

[10] Caluza et.al (2017) The New Surfacing Image of the Teaching Profession;Journal of Asian and African Studies https://doi.org/10.1177/0021909615607376

[11] Chen Yu-lin (2017) Impact of a pedometer-based goal-setting intervention on children's motivation, motor competence, and physical activity in physical education, Physical Education and Sport Pedagogy, 23:1, 54- 65, DOI: 10.1080/17408989.2017.1341475

[12] Cheok et.al (2020) Predictors of E-Learning Satisfaction in Teaching and Learning for School Teachers: A Literature Review; *International Journal of Instruction*, ISSN-1694-609X

[13] Cong L.M. (2020) Successful Factors for Adoption of Synchronous Tools in Online Teaching at Scale https://doi.org/10.1007/978-981-15-5883-2_4

[14] Cowling, M. (2019). Enhancing Learning of System Modelling through 3600 Virtual Reality Video and 3D Printing. Singapore (pp. 380-385).

[15] Demirbilek, M. (2019). "Chapter 12 A Case Study of Preparing Emirati Pre-Service Teachers to Integrate 3D Printing into Teaching and Learning". doi: https://doi.org/10.1163/9789004415133_012

[16] Dong Nguyen (2019) Middle leaders and middle leadership in schools: exploring theknowledge base (2003–2017), SchoolLeadership & Management, 39:3-4, 255-277, DOI: 10.1080/13632434.2019.1578738

[17] Firstater (2019) The Obstacles to ICT Implementation in the Kindergarten Environment: Kindergarten Teachers' Beliefs, Journal of Research in Childhood Education, 33:2, 165-179, DOI: 10.1080/02568543.2019.1577769

[18] Gahwaji et al. (2018) Tablets in Primary Schools: Results of a Study for Teaching the Human Organ Systems *International Journal of Smart Education and Urban Society* 9(3)DOI: 10.4018/IJSEUS.2018070101

[19] Hasse (2017) Technological literacy for teachers, Oxford Review of Education, 43:3, 365-378, DOI: 10.1080/03054985.2017.1305057

[20] Hazlehurst, C. (2018), "IB and Strategy Research on "New" Information and Communication Technologies: Guidance for Future Research", *International Business in the Information and Digital Age* (*Progress in International Business Research,* https://doi.org/10.1108/S1745-886220180000013004

[21] Higgins et al (2019) The role of ICT in early childhood education: Scale development and research on ICT use and influencing factors, European Early Childhood EducationResearch Journal, 23:2, 183- 199, DOI: 10.1080/1350293X.2015.1016804

[22] Horowitz et.al (2020) Transforming Teaching: New Skills for Online Language Learning Spaces. https://doi.org/10.1057/9781137412263_5

[23] Jackson (2017) Proposal for Virtual ICT Use in Sierra Leone Education System: A Case of MOODLE (2016). *Journal of Applied Thought*, Vol. 5, No. 1,

[24] Kara (2017) In-service Preschool Teachers' Thoughts about Technology and Technology Use in Early Educational Settings. *Contemporary Educational Technology, 8*(2), 119-141. https://doi.org/10.30935/cedtech/6191

[25] Karsenti et.al (2019) An empirical study on the correlation between teacher efficacy and ICT infrastructure, *The International Journal of Information and Learning Technology*, 10.1108/IJILT-04-2020-0050

[26] Liao et al (2017) Supporting Change in Teacher Practice: Examining Shifts of Teachers' Professional Development Preferences and Needs for Technology *Integration Journal* Volume 17, Number 4, December 2017 ISSN 1528-

[27] Martínez S,(2019) Tablet use in primary education, Technology, Pedagogy and Education, 28:3, 301-316, DOI:

10.1080/1475939X.2019.1608291

[28] Morioka (2018) Promoting ICT education in developing countries: Case Study in the PhilippineNeliswa. 20179: 1980. https://doi.org/10.3390/s17091980

[29] Nieuwsma D. (2019 ) Technology: Engagement and Motivation in the Elementary Classroom" (2019). *Master of Education Program Theses*. 136. https://digitalcollections.dordt.edu/med_theses/136

[30] Petko (2017) The Interplay of School Readiness and Teacher Readiness for Educational Technology Integration: A Structural Equation Model, Computers in the Schools, 35:1, 1- 18, DOI: 10.1080/07380569.2018.1428007

[31] Perveen A.(2016) Factors affecting asynchronous e-learning quality in developing countries university settings. *International Journal of Education and Development using ICT, 14* https://www.learntechlib.org/p/183551/.

[32] Qureshi (2019) Climate change adaptation for sustainable development: the information and communication technology (ICT) paradox, Information Technology for Development, 25:4, 625- 629, DOI: 10.1080/02681102.2019.1680164

[33] Reyes BC (2017) Robotics as an Educational Tool: Impact of Lego Mindstorms; *International Journal of Information and Education Technology*, Vol. 7, No. 6 doi: 10.18178/ijiet.2017.7.6.908

[34] Singhai A. et.al (2019). Meeting the "Digital Natives": Understanding the Acceptance of Technology in Classrooms. *Journal of Educational Technology & Society,* http://www.jstor.org/stable/jeductechsoci.16.1.392

[35] Stringel (2017)Technology improve reading outcomes? Comparing the effectiveness and cost-effectiveness of ICT interventions for early grade reading in Kenya,*International Journal of Educational Development*, https://doi.org/10.1016/j.ijedudev.2016.03.006.

[36] Tammets K. et.al. (2019). From digital literacy to digital competence: the teacher digital competency (TDC) framework; Education Tech Research Dev 68:2449–2472https://doi.org/10.1007/s11423-020-09767-4

[37] Viscovi (2019) At risk of exclusion? Degrees of ICT access and literacy among senior citizens, Information, Communication & Society, 22:1, 55-72, DOI: 10.1080/1369118X.2017.1355007

[38] Workneh,(2020) Evaluating integrated use of information technologies in secondary schools of Ethiopia using design-reality gap analysis: A school-level study, The Electronic Journal of Information Systems in Developing Countries, 10.1002/isd2.12148, 87, 1, (2020).